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## PATENT SPECIFICATION



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624,815

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Index at Acceptance :—Class 83(ii), A116.

### PROVISIONAL SPECIFICATION.

#### Improvements in or relating to Manufacture of Turbine Blades and the like.

We, EDGAR PHILLIPS PEREGRINE, of 5, Denwick Terrace, Tynemouth, in the County of Northumberland, a British subject, and THE PARSONS AND MARINE ENGINEERING TURBINE RESEARCH AND DEVELOPMENT ASSOCIATION, of Paremada Research Station, Wallsend, in the County of Northumberland, a Body Corporate organised under the laws of Great Britain, do hereby declare the nature of this invention to be as follows:—

This invention relates to methods of manufacturing turbine blades, compressor blades, buckets and the like.

These members are normally attached to a drum or cylinder by means of mechanical interlocks, the interlocking male portion being machined to form the root of, say a blade, and the drum or cylinder machined to form the female portion, or vice versa.

These members have as principal features the following design particulars:—

- (i) Cross-section indicating type and camber.
- (ii) Chord or blade width.
- (iii) Taper or orientation of cross-section at given distances from the root, e.g., twisted blades.
- (iv) Length of blade above root.
- (v) Pitch or angular distance between adjacent blades.
- (vi) Setting or orientation of root section to axis of cylinder or drum.

Blades may be manufactured by any of these means:—

- (1) Machined from bar stock (wrought or cast).
- (2) Machined all over from wrought or cast stock.
- (3) Partially machined from wrought or cast stock, the cast or wrought surface requiring little or no further treatment over some portions of the blade.
- (4) Wrought or cast to final shape without any machining other than dressing.

[Price 2/-]

The invention applies to blades or the like in categories (2), (3) and sometimes (4) and has for its object to standardise and economise in the production of all blades, which have particulars (i), (ii) and (iii) in common.

The object of the present invention is to enable a plurality of sets of turbine blades or the like having particulars (i) to (iii) in common to be formed by economical and simple production methods.

The invention consists in a method of manufacturing a plurality of sets of turbine blades, compressor blades or the like having particulars (i) to (iii) set out above in common wherein a number of identical blanks each in the form of a blade with integral cylindrical base are cast or wrought by rolling or stamping and the blanks are shaped by simple manufacturing operations to produce sets of finished blades having different characteristics (iv) to (vi) set forth above.

The invention also consists in a set of blades or the like constructed in accordance with the method set forth in the preceding paragraph.

In carrying the invention into effect according to one form by way of example as applied to a plurality of sets of turbine blades, located by means of side serrations on parallelepiped roots fulfilling design particulars (iv) to (vi), we provide a plurality of identical blanks cast or wrought by rolling or stamping each to form a blade portion and an integral root portion, the latter comprising a circular cylindrical part.

The root portions of sets of these blanks are subsequently machined to conform with the design particulars (iv) to (vi) as set forth above.

Dated this 2nd day of July, 1947.

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## COMPLETE SPECIFICATION.

## Improvements in or relating to Manufacture of Turbine Blades and the like.

We, EDGAR PHILLIPS PEREGRINE, of 5, Denwick Terrace, Tynemouth, in the County of Northumberland, a British subject, and THE PARSONS AND MARINE ENGINEERING TURBINE RESEARCH AND DEVELOPMENT ASSOCIATION, of Panmetrada Research Station, Wallsend, in the County of Northumberland, a Body Corporate organised under the laws of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

15 This invention relates to methods of manufacturing turbine blades, compressor blades, buckets and the like.

These members are normally attached to a drum or cylinder by means of mechanical interlocks, the interlocking male portion being machined to form the root of, say a blade, and the drum or cylinder machined to form the female portion, or vice versa.

These members have as principal features the following design particulars:—

(i) Cross-section giving the details of the local steam or gas flow path by defining the geometrical outline and camber.

(ii) Chord or blade width.

(iii) Variation of cross-section from one point to another along the blade length and orientation of cross-section at given distances from the root (twisted blades).

(iv) Length of blade above root.

(v) Pitch or angular distance between adjacent blades.

(vi) Setting or orientation of root section to axis of cylinder or drum.

Blades may be manufactured by any of these means:—

(1) Machined from bar stock (wrought, cast or moulded)

(2) Machined all over from wrought, cast or moulded stock.

(3) Partially machined from wrought, cast or moulded stock, the cast, wrought or moulded surface requiring little or no further treatment over some portions of the blade.

(4) Wrought, cast or moulded to final shape without any machining other than dressing.

The invention applies to blades or the like in categories (2), (3) and sometimes (4) and has for its object to standardise and economise in the production of all blades which have particulars (i), (ii) and (iii) in common.

The object of the present invention is to enable a plurality of sets of turbine blades or the like having particulars (i) to (iii) in common to be formed by economical and simple production methods.

The invention consists in a method of manufacturing a plurality of sets of turbine blades, compressor blades or the like having particulars (i) to (iii) set out above in common wherein a number of identical blanks each in the form of a blade with integral cylindrical base are cast or wrought by rolling or stamping and the blanks are shaped by simple machining and/or grinding and/or polishing operations to produce sets of finished blades having different characteristics (iv) to (vi) set forth above.

The invention also consists in a set of turbine or like blades constructed in accordance with the method set forth in the preceding paragraph.

Referring to the accompanying diagrammatic drawings.

Figure 1 is an elevational view of a blank from which sets of blades may be formed in accordance with the present invention.

Figure 2 is a plan view thereof.

Figure 3 is an elevational view of one of a set of blanks constructed from the blank of Figures 1 and 2.

Figure 4 is a plan view thereof.

Figure 5 is an elevational view of one of another set of blanks constructed from the blank of Figures 1 and 2, and

Figure 6 is a plan view thereof.

In carrying the invention into effect according to one form by way of example as applied to a plurality of sets of turbine blades, located by means of side serrations on parallelepiped roots fulfilling design particulars (iv) to (vi), we provide a plurality of identical blanks (Figs. 1 and 2) cast or wrought by rolling, stamping or moulding each to form a blade portion *a* and an integral root portion, the latter comprising a circular cylindrical part *b*.

The root portions of one set of these blanks are subsequently machined to the form indicated in Figs. 3 and 4, viz., for a predetermined pitch or angular distance between adjacent blades and with a predetermined setting or orientation of the root sections *c* to the longitudinal axis of a rotor or drum whilst the blade portions are machined to a predetermined length above the roots *c*.

The root portions of another set of these

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blanks are machined to the form indicated in Figures 5 and 6, viz. for a predetermined pitch between adjacent blades and a predetermined setting of the root sections c 5 whilst the blade parts are machined to a different length from those indicated in Figure 3.

Having now particularly described and ascertained the nature of our said invention 10 and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of manufacturing a plurality of sets of turbine blades, compressor 15 blades or the like having particulars (i) to

(iii) set out above in common, wherein a plurality of identical blanks each in the form of a blade with integral cylindrical base are cast or wrought by rolling, stamping or moulding and the blanks are shaped by simple machining and/or grinding and/or polishing operations to produce sets of finished blades having different characteristics (iv) to (vi) set forth above.

2. A set of turbine or like blades constructed in accordance with the method claimed in Claim 1.

Dated this 9th day of April, 1948.  
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[This Drawing is a reproduction of the Original on a reduced scale.]

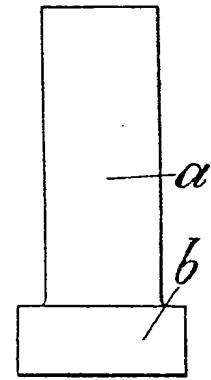


Fig. 1.

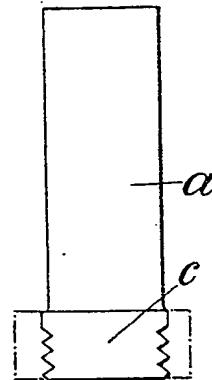


Fig. 3

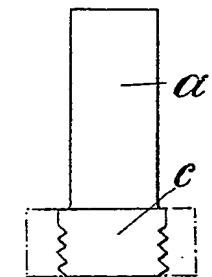


Fig. 5

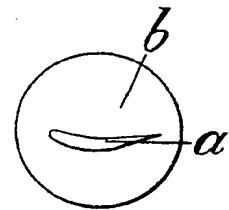


Fig. 2.

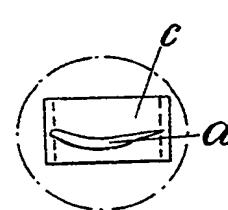


Fig. 4.

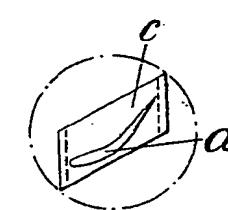


Fig. 6.